FOREWORD

Since the implementation of the National Bridge Inspection Program in 1971, State Departments of Transportation have invested significant resources to evaluate the condition of their bridges. These inspections are primarily conducted within the context of the National Bridge Inspection Standards that require reporting of bridge condition in a standardized format. This standardized format uses a uniform set of condition ratings to describe the condition of a bridge. Key elements of the inspection include the condition ratings for the deck, superstructure, and substructure of the bridge. The assignment of condition ratings to elements of the bridge is used to measure bridge performance at the national level, to forecast future funding needs, to determine the distribution of funds between States, and to evaluate if a particular bridge renovation project qualifies for Federal assistance. Obviously, the accuracy of the condition ratings is important to ensure that FHWA programs for funding bridge construction and renovation are equitable and meet the goal of reducing the number of deficient bridges.

The accuracy and reliability of the inspection process that results in condition ratings for Highway Bridges has not been researched previously. This report documents the findings of the first comprehensive study of the inspection process since the adoption of the National Bridge Inspection Standards. The study provides overall measures of the reliability and accuracy of bridge inspection, identifies factors that may influence the inspection results, and determines what procedural differences exist between various State inspection programs. This report will be of interest to bridge engineers, designers, and inspectors who are involved with the inspection of our Nation’s highway bridges.

T. Paul Teng, P.E.
Director, Office of Infrastructure Research and Development

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Abstract

Visual Inspection is the predominant nondestructive evaluation technique used in bridge inspections. However, since the implementation of the National Bridge Inspection Standards in 1971, a comprehensive study of the reliability of Visual Inspection as it relates to highway bridge inspections has not been conducted. The goals of the study include: providing overall measures of the accuracy and reliability of Routine and In-Depth Visual Inspections, studying the influence of several key factors that affect Routine and In-Depth Inspections, and studying the differences between State inspection procedures and reports.

Ten inspection tasks were performed at seven test bridges using State bridge inspectors. The sample of participating inspectors included 49 inspectors from 25 State agencies. Inspectors were provided with common information, instruction, and tools. Inspector characteristics were measured through self-report questionnaires, interviews, and direct measurements.

Routine Inspections were completed with significant variability, and the Condition Ratings assigned varied over a range of up to five different ratings. It is predicted that only 68 percent of the Condition Ratings will vary within one rating point of the average, and 95 percent will vary within two points. Factors that appeared to correlate with Routine Inspection results include Fear of Traffic; Visual Acuity and Color Vision; Light Intensity; Inspector Rushed Level; and perceptions of Maintenance, Complexity, and Accessibility.

In-Depth Inspections using Visual Inspection alone are not likely to detect or identify the specific types of defects for which the inspection is prescribed, and may reveal deficiencies beyond those that could be noted during a Routine Inspection. The overall thoroughness with which inspectors completed one of the In-Depth tasks tended to have an impact on the likelihood of an inspector detecting weld crack indications. Other factors that may be related to In-Depth Inspection accuracy include: time to complete inspection, comfort with access equipment and heights, structure complexity and accessibility, viewing of welds, flashlight use, and number of annual inspections performed.

The State procedural and reporting tasks indicated that most States follow similar procedural and reporting criteria. Several inconsistencies were noted with the use of the element-level inspection systems, but it is not known if these variations are the result of State practices or inspector use. Deck delamination surveys were found to have significant variability, with only a few teams performing a delamination survey as part of the Routine Inspection.

This volume is the second in a series of two. The other volume in the series is: FHWA-RD-01-020, Volume I: Final Report.
# TABLE OF CONTENTS

| APPENDIX A. STATE, COUNTY, AND CONTRACTOR SURVEY FORMS | A-1 |
| States Survey | A-3 |
| Iowa County Survey | A-9 |
| Consultant Survey | A-15 |

| APPENDIX B. COMPLETE RESPONSES TO ACCOMPLISHMENTS QUESTION | B-1 |
| STATE RESPONSES | B-3 |
| COUNTY RESPONSES | B-6 |

| APPENDIX C. ADVANCE INFORMATION PACKAGE | C-1 |

| APPENDIX D. SUMMARIES OF OVERALL BRIDGE CONDITIONS | D-1 |
| DEFECT AND CONDITION SUMMARY FOR BRIDGE B521 | D-3 |
| DEFECT AND CONDITION SUMMARY FOR BRIDGE B101A | D-7 |
| DEFECT AND CONDITION SUMMARY FOR BRIDGE B111A | D-11 |
| DEFECT AND CONDITION SUMMARY FOR BRIDGE B543 | D-15 |
| DEFECT AND CONDITION SUMMARY FOR BRIDGE B544 | D-19 |
| DEFECT AND CONDITION SUMMARY FOR ROUTE 1 BRIDGE | D-23 |
| DEFECT AND CONDITION SUMMARY FOR VAN BUREN ROAD BRIDGE | D-27 |

| APPENDIX E. TASK PROTOCOLS | E-1 |
| TASK A PROTOCOL | E-3 |
| TASK B PROTOCOL | E-5 |
| TASK C PROTOCOL | E-7 |
| TASK D PROTOCOL | E-9 |
| TASK E PROTOCOL | E-11 |
| TASK F PROTOCOL | E-13 |
| TASK G PROTOCOL | E-15 |
| TASK H PROTOCOL | E-17 |
| TASK I PROTOCOL | E-19 |

| APPENDIX F. SELF-REPORT QUESTIONNAIRES | F-1 |
| SELF-REPORT QUESTIONNAIRE | F-3 |
## EXIT SELF-REPORT QUESTIONNAIRE ................................................................. F-9

## APPENDIX G. INSPECTOR CHARACTERIZATION PROTOCOLS ................ G-1

- **Protocol for the Administration of the Self-Report Questionnaire** ................................................................. G-3
- **Protocol for the Administration of the Near Visual Acuity Test** ............................................................................. G-5
- **Protocol for the Administration of the Distance Visual Acuity Test** ................................................................. G-7
- **Protocol for the Administration of the PV-16 Color Vision Test** ............................................................................. G-9

## APPENDIX H. PRE-EXPERIMENT EVALUATION FORMS ............................. H-1

- **Task A Pre-Experiment Evaluation Form** ................................................................. H-3
- **Task B Pre-Experiment Evaluation Form** ................................................................. H-5
- **Task C Pre-Experiment Evaluation Form** ................................................................. H-7
- **Task D Pre-Experiment Evaluation Form** ................................................................. H-9
- **Task E Pre-Experiment Evaluation Form** ................................................................. H-11
- **Task F Pre-Experiment Evaluation Form** ................................................................. H-13
- **Task G Pre-Experiment Evaluation Form** ................................................................. H-15
- **Task H Pre-Experiment Evaluation Form** ................................................................. H-17
- **Task I Pre-Experiment Evaluation Form** ................................................................. H-19

## APPENDIX I. POST-EXPERIMENT EVALUATION FORMS .............................. I-1

- **Task A Post-Experiment Evaluation Form** ................................................................. I-3
- **Task B Post-Experiment Evaluation Form** ................................................................. I-5
- **Task C Post-Experiment Evaluation Form** ................................................................. I-7
- **Task D Post-Experiment Evaluation Form** ................................................................. I-9
- **Task E Post-Experiment Evaluation Form** ................................................................. I-11
- **Task F Post-Experiment Evaluation Form** ................................................................. I-13
- **Task G Post-Experiment Evaluation Form** ................................................................. I-15
- **Task H Post-Experiment Evaluation Form** ................................................................. I-17
- **Task I Post-Experiment Evaluation Form** ................................................................. I-19

## APPENDIX J. OBSERVER DATA FORMS ............................................................... J-1
<table>
<thead>
<tr>
<th>Task</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task A</td>
<td>J-3</td>
</tr>
<tr>
<td>Task B</td>
<td>J-7</td>
</tr>
<tr>
<td>Task C</td>
<td>J-11</td>
</tr>
<tr>
<td>Task D</td>
<td>J-15</td>
</tr>
<tr>
<td>Task E</td>
<td>J-17</td>
</tr>
<tr>
<td>Task F</td>
<td>J-19</td>
</tr>
<tr>
<td>Task G</td>
<td>J-23</td>
</tr>
<tr>
<td>Task H</td>
<td>J-25</td>
</tr>
<tr>
<td>Task I</td>
<td>J-29</td>
</tr>
<tr>
<td>Task J</td>
<td>J-33</td>
</tr>
<tr>
<td>Appendix K</td>
<td>K-1</td>
</tr>
<tr>
<td>Appendix L</td>
<td>L-1</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure L1. Influence of inspection factor Reported Thoroughness Level (1=Much less thorough than normal, 9=Much more thorough than normal) on Condition Ratings ................................................................. L-4
Figure L2. Influence of inspection factor Light Intensity Below Superstructure on Condition Ratings ................................................................. L-5
Figure L3. Influence of inspection factor Observed Inspector Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings ............................................. L-7
Figure L4. Influence of inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings ................................................... L-8
Figure L5. Influence of inspection factor Reported Task Similarity to Normal (1=Not similar, 9=Very similar) on Condition Ratings ........................................ L-9
Figure L6. Influence of inspection factor Observed Inspector Focus Level (1=Very unfocused, 9=Very focused) on Condition Ratings ................................. L-10
Figure L7. Influence of inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on Condition Ratings .......... L-11
Figure L8. Influence of inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on Condition Ratings ................................... L-12
Figure L9. Influence of inspection factor Wind Speed on Condition Ratings .............................................................................................................. L-13
Figure L10. Influence of inspection factor Reported Observer Influence (1=No influence, 9=Great influence) on Condition Ratings ........................................ L-14
Figure L11. Influence of inspection factor Light Intensity on Deck on Condition Ratings ................................................................. L-15
Figure L12. Influence of inspection factor Reported Effort Level (1=Much lower than normal, 9=Much greater than normal) on Condition Ratings .......... L-16
Figure L13. Influence of inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on Condition Ratings ............................. L-17
Figure L14. Influence of inspection factor Time Since Similar Inspection on Condition Ratings ................................................................. L-18
Figure L15. Influence of inspection factor Estimated Time for Task on Condition Ratings ..................................................................................................... L-19
Figure L16. Influence of inspection factor Rested Level Before Task (1=Very tired, 9=Very rested) on Condition Ratings ........................................................ L-20
Figure L17. Influence of inspection factor Accuracy of Task at Measuring Inspection Skills (1=Very inaccurate, 9=Very accurate) on Condition Ratings .... L-21
Figure L18. Influence of inspection factor Actual Time to Complete Task on Condition Ratings ................................................................. L-22

Figure L19. Influence of combined inspector/inspection factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on Condition Ratings ........................................ L-23

Figure L20. Influence of combined inspector/inspection factor Reported Thoroughness Level (1=Less thorough than normal, 9=More thorough than normal) on Condition Ratings ................................................................. L-24

Figure L21. Influence of combined inspector/inspection factor Light Intensity Below Superstructure on Condition Ratings ............................................. L-25

Figure L22. Influence of combined inspector/inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on Condition Ratings ...... L-27

Figure L23. Influence of combined inspector/inspection factor Observed Inspector Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings ............... L-28

Figure L24. Influence of combined inspector/inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings ..................................... L-29

Figure L25. Influence of combined inspector/inspection factor General Mental Condition (1=Poor, 5=Superior) on Condition Ratings ..................................................... L-30

Figure L26. Influence of combined inspector/inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on Condition Ratings ................................................................................ L-31

Figure L27. Influence of combined inspector/inspection factor Wind Speed on Condition Ratings ................................................................................ L-32

Figure L28. Influence of combined inspector/inspection factor Reported Task Similarity to Normal (1=Not similar, 9=Very similar) on Condition Ratings .......... L-33

Figure L29. Influence of combined inspector/inspection factor Reported Observer Influence (1=No influence, 9=Great influence) on Condition Ratings .......... L-34

Figure L30. Influence of combined inspector/inspection factor Number of Annual Bridge Inspections on Condition Ratings ..................................................... L-35

Figure L31. Influence of combined inspector/inspection factor General Education Level (1=Some high school, 10=Terminal degree) on Condition Ratings .................. L-36

Figure L32. Influence of combined inspector/inspection factor Right Eye Near Visual Acuity on Condition Ratings ................................................................. L-37

Figure L33. Influence of combined inspector/inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on Condition Ratings .. L-38

Figure L34. Influence of combined inspector/inspection factor Estimated Time for Task on Condition Ratings ........................................................................... L-39
Figure L35. Influence of combined inspector/inspection factor Rested Level Before Task (1=Very tired, 9=Very rested) on Condition Ratings............................... L-40
Figure L36. Influence of combined inspector/inspection factor Accuracy of Task at Measuring Inspection Skills (1=Very inaccurate, 9=Very accurate) on Condition Ratings................................................................. L-41
Figure L37. Influence of combined inspector/inspection factor Actual Time to Complete Task on Condition Ratings................................................................................. L-42
Figure L38. Influence of inspector factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on DFR ................................................................. L-43
Figure L39. Influence of inspector factor Color Vision (number of major confusions) on DFR .............................................................................................................. L-43
Figure L40. Influence of inspector factor Left Eye Near Visual Acuity on DFR............ L-44
Figure L41. Influence of inspector factor Formal Bridge Inspection Training (number of FHWA training courses) on DFR ................................................................. L-44
Figure L42. Influence of inspector factor Quality of Relationship With Supervisor (1=Very poor, 5=Very good) on DFR................................................................. L-45
Figure L43. Influence of inspector factor Left Eye Distance Visual Acuity on DFR ........ L-45
Figure L44. Influence of inspector factor Reported Fear of Enclosed Spaces (1=Very fearful, 4=No fear) on DFR................................................................. L-46
Figure L45. Influence of inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on DFR ................................................................. L-46
Figure L46. Influence of inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on DFR ................................................................. L-47
Figure L47. Influence of inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on DFR................................................................. L-47
Figure L48. Influence of inspection factor Light Intensity on Deck on DFR....................... L-48
Figure L49. Influence of inspection factor Light Intensity Below Superstructure on DFR .............................................................................................................. L-48
Figure L50. Influence of inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on DFR ................................................................. L-49
Figure L51. Influence of inspection factor Wind Speed on DFR ................................... L-49
Figure L52. Influence of combined inspector/inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on DFR ........ L-50
Figure L53. Influence of combined inspector/inspection factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on DFR ................................................................. L-50
Figure L54. Influence of combined inspector/inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on DFR ......................... L-51
Figure L55. Influence of combined inspector/inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on DFR ..................... L-51
Figure L56. Influence of combined inspector/inspection factor Light Intensity on Deck on DFR .............................................................................................................. L-52
Figure L57. Influence of combined inspector/inspection factor Color Vision (number of major confusions) on DFR ................................................................................ L-52
Figure L58. Influence of combined inspector/inspection factor Light Intensity Below Superstructure on DFR .............................................................................................................. L-53
Figure L59. Influence of inspector factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on general DFR ............................................................. L-53
Figure L60. Influence of inspector factor Color Vision (number of major confusions) on general DFR ................................................................................................. L-54
Figure L61. Influence of inspector factor Left Eye Near Visual Acuity on general DFR .............................................................................................................. L-54
Figure L62. Influence of inspector factor Formal Bridge Inspection Training (number of FHWA training courses) on general DFR ............................................................. L-55
Figure L63. Influence of inspector factor Left Eye Distance Visual Acuity on general DFR .............................................................................................................. L-55
Figure L64. Influence of inspector factor General Mental Focus (1=Poor, 5=Very focused) on general DFR .............................................................................................................. L-56
Figure L65. Influence of inspector factor Reported Fear of Enclosed Spaces (1=Very fearful, 4=No fear) on general DFR ............................................................. L-56
Figure L66. Influence of inspection factor Reported Structure Accessibility (1=Very inaccessible, 9=Very accessible) on general DFR ............................................................. L-57
Figure L67. Influence of inspection factor Reported Structure Maintenance (1=Very poorly, 9=Very well) on general DFR ............................................................. L-57
Figure L68. Influence of inspection factor Light Intensity on Deck Level on general DFR .............................................................................................................. L-58
Figure L69. Influence of inspection factor Light Intensity Below Superstructure on general DFR .............................................................................................................. L-58
Figure L70. Influence of inspection factor Reported Structure Complexity (1=Very simple, 9=Very complex) on general DFR ............................................................. L-59
Figure L71. Influence of inspection factor Wind Speed on general DFR .............................................................................................................. L-59
Figure L72. Influence of inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on general DFR .......................................................... L-60

Figure L73. Influence of combined inspector/inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on general DFR .......................................................... L-60

Figure L74. Influence of combined inspector/inspection factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on general DFR ........................................ L-61

Figure L75. Influence of combined inspector/inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on general DFR .......... L-61

Figure L76. Influence of combined inspector/inspection factor Light Intensity on Deck on general DFR .......................................................... L-62

Figure L77. Influence of combined inspector/inspection factor Color Vision (number of major confusions) on general DFR ........................................ L-62

Figure L78. Influence of combined inspector/inspection factor Light Intensity Below Superstructure on general DFR ........................................ L-63

Figure L79. Influence of combined inspector/inspection factor Left Eye Near Visual Acuity on general DFR ........................................ L-63
Please answer all questions in this voluntary survey to the best of your ability. Note that some questions may require you to respond as if you were responsible for your state’s bridge inspection unit. If you wish to comment further on any question(s) or qualify your answer, feel free to include additional sheets or use the margins. Upon completion of the study, participants will receive a draft of compiled responses.

Any questions regarding this survey should be addressed to Mr. Dennis Rolander at the NDE Validation Center at (703) 285-1133. Return the completed questionnaire by **January 29, 1998** by faxing to (703) 285-1175 or mailing to:

NDE Validation Center – HNR-20  
State of the Practice Survey NDE/Visual Inspection  
6300 Georgetown Pike  
McLean, VA 22101-2296  
ATTN: Dennis Rolander

Questionnaire completed by: _____________________________________________________  
Position/Title: _________________________________________________________________  
Address: ___________________________________________________________________  
City/State/Zip: _________________________________________________________________  
Phone No.: _________________________  Fax No.: _______________________________  
Email Address: __________________________________

Section 1 – Composition of Bridge Inspection Team for Visual Inspection

1. Are your bridge inspections completed by Department of Transportation (DOT) staff or by outside Contractors? **(circle one)**  
   - Only DOT staff  
   - Only Contractors  
   - Both DOT staff and Contractors

2. If the answer to Question 1 is “Both DOT staff and Contractors,” in what situations are Contractors utilized? **(mark all that apply)**  
   - Routine inspections  
   - Fracture critical inspections  
   - Advanced NDE techniques  
   - Complex structures  
   - Structures with complex traffic control situations  
   - Underwater inspections  
   - Other (please describe below)
3. For the following hypothetical bridge, how many people would make-up a field inspection team (excluding traffic control personnel), and how much time (in man-hours) would be budgeted?
   Twenty-year old, two-span bridge carrying two-lane road (medium ADT) over a small creek, maximum height above the creek is 20 ft.
   **Superstructure**: Steel, four-girder superstructure (rolled shapes); welded flange cover plates; concrete deck.
   **Substructure**: Concrete abutments, a single three-column concrete pier (with pier cap) out of the normal watercourse.

   People: __________
   Man-hours: __________

4. What are the minimum, maximum, and typical numbers of personnel that would make up a bridge inspection team (excluding traffic control personnel)?

   Minimum: __________
   Maximum: __________
   Typical: __________

5. Estimate the percentage of bridge inspections completed with a registered Professional Engineer (PE) **on-site**? (circle one)

   0-20%  21-40%  41-60%  61-80%  81-100%

6. When a PE is included as part of the on-site inspection team, what conditions would dictate his/her presence?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

7. Please indicate the average number of years of experience in bridge inspection at each of the following positions. (circle the appropriate responses)

   **Team Leader:**
   0-5 years & PE  5-10 years  More than 10 years

   **Other team members:**
   0-5 years  5-10 years  More than 10 years

---

**Section 2 – Impact of Administrative Requirements on Visual Inspection**

1. If additional resources were made available for bridge inspection, please indicate how you might allocate those additional resources (for example, increased time per inspection, increased use of NDE methods, increased use of bridge inventory management software, etc.)?

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. Approximately how many bridge inspectors are in your bridge inspection unit?

   1-5  6-10  11-15  16-20  21-25  26-30  31-40  41-50  More than 50
3. What type of training do you require of bridge inspectors? (mark all that apply)

   Team leaders:
   _____ Associate’s Degree CE Technology
   _____ Bachelor’s Degree CE
   _____ Stream Stability Course
   _____ Bridge Inspector’s Training Course
   _____ Fracture Critical Inspection Course
   _____ Other Training Courses (please specify)

   Other team members:
   _____ Associate’s Degree CE Technology
   _____ Bachelor’s Degree CE
   _____ Stream Stability Course
   _____ Bridge Inspector’s Training Course
   _____ Fracture Critical Inspection Course
   _____ Other Training Courses (please specify)

4. Could you suggest any changes in administrative or inspection procedure or policy that may improve inspection performance? Explain.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

5. Do you test the vision of inspectors (with corrective lenses if necessary)? Yes No

6. For a given bridge, are copies of previous inspection reports made available to the inspectors prior to arriving at the bridge site? (circle one) Yes No

7. Are inspectors permitted to use copies of previous inspection reports at the bridge site? (circle one) Yes No

8. Who determines the order of field inspection tasks? (Mark the most appropriate response)
   _____ “Management” provides a checklist to the on-site team to organize the inspection process.
   _____ Individual inspectors on-site set the inspection process.

9. Approximately how many bridges are inspected by your organization each year? __________

10. What measures do you have in place to assure quality inspections?
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________

11. Please describe any recent accomplishments of your bridge inspection program. (For example, an innovative inspector training program, successful implementation of new NDE technologies, identification of potentially life-threatening conditions, etc.).
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
Section 3 – Current and Future Use of NDE Techniques

1. Do you have any American Society for Nondestructive Testing (ASNT) Level III Inspectors on staff? (circle one)
   Yes          No

   If so, what method(s) are they certified for? (check all those that apply)
   _____ Acoustic Emission (AE)
   _____ Electromagnetic Testing (ET)
   _____ Leak Testing (LT)
   _____ Liquid Penetrant Testing (PT)
   _____ Magnetic Particle Testing (MT)
   _____ Neutron Radiographic Testing (NRT)
   _____ Radiographic Testing (RT)
   _____ Thermal/Infrared Testing (TIR)
   _____ Ultrasonic Testing (UT)
   _____ Vibration Analysis Testing (VA)
   _____ Visual Testing (VT)

   If applicable, are these ASNT Level III Inspectors routinely used in field situations? (circle one)
   Yes          No

2. Mark any certifications which the typical Bridge Inspection Team Member may hold. (Mark all that apply. Note that NICET refers to the National Institute for Certification In Engineering Technologies (NICET) Bridge Safety Inspection.)

   Team Leader
   _____ PE License
   _____ ASNT Level I
   _____ ASNT Level II
   _____ ASNT Level III
   _____ NICET Level I
   _____ NICET Level II
   _____ NICET Level III
   _____ NICET Level IV
   _____ Other ____________________

   Other Team Members
   _____ PE License
   _____ ASNT Level I
   _____ ASNT Level II
   _____ ASNT Level III
   _____ NICET Level I
   _____ NICET Level II
   _____ NICET Level III
   _____ NICET Level IV
   _____ Other ____________________

3. What NDE techniques are currently utilized on bridges under your jurisdiction? (mark all that apply)

   Steel:
   Acoustic Emission       Eddy Current       Other Electromagnetic Testing
   Liquid Penetrant        Magnetic Particle    Radiography
   Thermal/Infrared        Ultrasonic         Vibration Analysis
   Visual Inspection       Other ____________________

   Concrete:
   Acoustic Emission       Cover Meters/Pachometers   Electrical Potential Measurements
   Mechanical Sounding (chain drag)  Radar  Radiography
   Rebound Hammer          Thermal/Infrared      Ultrasonics (Pulse Velocity)
   Ultrasonics (Impact Echo) Vibration Analysis  Visual Inspection
   Other ____________________

A-6
Timber:
Acoustic Emission  Mechanical Sounding  Moisture Meter
Radiography  Stress Wave Analysis  Visual Inspection
Other __________________________________________________________

Other Materials:
Material/Technique
1) __________________________________________________________________
2) __________________________________________________________________
3) __________________________________________________________________

4. Of these NDE techniques, which method do you use most often for each material?
   Steel: __________________________________________________________________
   Concrete: __________________________________________________________________
   Timber: __________________________________________________________________
   Other Materials: __________________________________________________________________

5. Have you stopped using any NDE techniques due to unreliable performance or for any other reason? If so, which techniques and why?
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________

6. What general area of NDE applications would you like to see more research into? (mark one)
   ___ Concrete decks
   ___ Concrete superstructure
   ___ Steel superstructure
   ___ Prestressed concrete superstructure
   ___ Timber decks/timber substructure

In conjunction with the development of the Federal Highway Administration’s new NDE Validation Center, we plan to ask bridge inspection teams to participate in various visual inspection benchmark tests. The information gathered during these “hands-on” benchmark tests will provide bridge inspectors with valuable information about the factors affecting the reliability of visual inspection. The goal of this survey and the follow-up visual inspection tests is to help the bridge inspection community to perform more reliable bridge inspections. Would you be willing to participate in the “hands-on” study?

Thank you for your time in completing this questionnaire. Your answers will allow the NDE Validation Center team to focus their efforts in the areas that will benefit the bridge inspection community the most.
Please answer all questions in this voluntary survey to the best of your ability. Note that some questions may require you to respond as if you were responsible for your county’s bridge inspection unit. If you wish to comment further on any question(s) or qualify your answer, feel free to include additional sheets or use the margins. Upon completion of the study, participants will receive a draft of compiled responses.

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NDE Validation Center – HNR-20
State of the Practice Survey NDE/Visual Inspection
6300 Georgetown Pike
McLean, VA 22101-2296
ATTN: Dennis Rolander

Questionnaire completed by: _______________________________________________________
Position/Title: __________________________________________________________________
Address: _______________________________________________________________________
City/State/Zip: ___________________________________________________________________
Phone No.: __________________ Fax No.: __________________
Email Address: ______________________

Section 1 – Composition of Bridge Inspection Team for Visual Inspection

1. Are your bridge inspections completed by county personnel, state personnel, or by Contractors? (circle one)

   County Personnel               State Personnel               Contractors               Blend of three

2. If non-county personnel are used for bridge inspections in Question 1, in what situations are they involved? (mark all that apply)

   ___ Routine Inspections
   ___ Fracture Critical Member Inspections
   ___ Advanced NDE techniques
   ___ Complex structures
   ___ Structures with complex traffic control situations
   ___ Underwater inspections
   ___ Other (please describe below)

   __________________________________________________________
   __________________________________________________________

   __________________________________________________________
   __________________________________________________________
3. For the following hypothetical bridge, how many people would make-up a field inspection team (excluding traffic control personnel), and how much time (in man-hours) would be budgeted?
   Twenty-year old, two-span bridge carrying two-lane road (medium ADT) over a small creek, maximum height above the creek is 20 ft.
   **Superstructure**: Steel, fabricated four-girder superstructure (rolled shapes); welded flange cover plates; concrete deck.
   **Substructure**: Concrete abutments, a single three-column concrete pier (with pier cap) out of the normal watercourse.

   People: ___________________
   Man-hours: ________________

4. What are the minimum, maximum, and typical numbers of personnel that would make up a bridge inspection team (excluding traffic control personnel)?

   Minimum: ________________
   Maximum: ________________
   Typical: ________________

5. Estimate the percentage of bridge inspections completed with a registered Professional Engineer (PE) on-site? (*circle one*)

   0-20%  21-40%  41-60%  61-80%  81-100%

6. When a PE is included as part of the on-site inspection team, what conditions would dictate his/her presence?

   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________

7. Please indicate the average number of years of experience in bridge inspection at each of the following positions (*circle the appropriate response*).

   **Team Leader:**
   0-5 years (& PE)  5-10 years  More than 10 years

   **Other team members:**
   0-5 years  5-10 years  More than 10 years

---

**Section 2 – Impact of Administrative Requirements on Visual Inspection**

1. If additional resources were available for bridge inspection, please indicate how you might allocate those additional resources (for example, increased time per inspection, increased use of NDE methods, increased use of bridge inventory management software, etc.)?

   _______________________________________________________________________
   _______________________________________________________________________
   _______________________________________________________________________

2. Approximately how many bridge inspectors are in your bridge inspection unit?

   1-5  6-10  11-15  16-20  21-25  26-30  31-40  41-50  More than 50
3. What type and how much training do you require of bridge inspectors? *(mark all that apply)*

Team leaders:
- _____ Associate’s Degree CE Technology  _____ Bridge Inspector’s Training Course
- _____ Bachelor’s Degree CE  _____ Fracture Critical Inspection Course
- _____ Stream Stability Course  _____ Other Training Courses *(please specify)*

_______________________________________________________________________
_______________________________________________________________________

Other team members:
- _____ Associate’s Degree CE Technology  _____ Bridge Inspector’s Training Course
- _____ Bachelor’s Degree CE  _____ Fracture Critical Inspection Course
- _____ Stream Stability Course  _____ Other Training Courses *(please specify)*

_______________________________________________________________________
_______________________________________________________________________

4. Could you suggest any changes in administrative or inspection procedure or policy that may improve inspection performance? Explain.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

5. Do you test the vision of the inspectors (with corrective lenses if necessary)?  Yes  No

6. For a given bridge, are copies of previous inspection reports made available to the inspectors prior to arriving at the bridge site? *(circle one)*  Yes  No

7. Are inspectors permitted to use copies of previous inspection reports at the bridge site? *(circle one)*  Yes  No

8. Who determines the order of field inspection tasks? *(Mark the most appropriate response)*
   - _____ “Management” provides a checklist to the on-site team to organize the inspection process.
   - _____ Individual inspectors on-site set the inspection process.

9. Approximately how many bridges are inspected by your organization each year? __________

10. What measures do you have in place to assure quality inspections?

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

11. Please describe any recent accomplishments of your bridge inspection program. *(For example, an innovative inspector training program, successful implementation of new NDE technologies, identification of potentially life-threatening conditions, etc.)*

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

A-11
Section 3 – Current and Future Use of NDE Techniques

1. Do you have any American Society for Nondestructive Testing (ASNT) Level III Inspectors on staff? (circle one)
   Yes          No

If so, what method(s) are they certified for? (check all those that apply)
   _____ Acoustic Emission (AE)
   _____ Electromagnetic Testing (ET)
   _____ Leak Testing (LT)
   _____ Liquid Penetrant Testing (PT)
   _____ Magnetic Particle Testing (MT)
   _____ Neutron Radiographic Testing (NRT)
   _____ Radiographic Testing (RT)
   _____ Thermal/Infrared Testing (TIR)
   _____ Ultrasonic Testing (UT)
   _____ Vibration Analysis Testing (VA)
   _____ Visual Testing (VT)

If applicable, are these ASNT Level III Inspectors routinely used in field situations? (circle one)
   Yes  No

2. Mark any certifications which the typical Bridge Inspection Team Member may hold. (Mark all that apply. Note that NICET refers to the National Institute for Certification in Engineering Technologies (NICET) Bridge Safety Inspection.)

   Team Leader            Other Team Members
   ______ PE License       ______ PE License
   ______ ASNT Level I    ______ ASNT Level I
   ______ ASNT Level II   ______ ASNT Level II
   ______ ASNT Level III  ______ ASNT Level III
   ______ NICET Level I   ______ NICET Level I
   ______ NICET Level II  ______ NICET Level II
   ______ NICET Level III ______ NICET Level III
   ______ NICET Level IV  ______ NICET Level IV
   ______ Other ___________ ______ Other ___________

3. What NDE techniques are currently utilized on bridges under your jurisdiction? (mark all that apply)

   Steel:
   Acoustic Emission  Eddy Current  Other Electromagnetic Testing
   Liquid Penetrant    Magnetic Particle Radiography
   Thermal/Infrared  Ultrasonic  Vibration Analysis
   Visual Inspection  Other  _______________________________________________

   Concrete:
   Acoustic Emission  Cover Meters/Pachometers Electrical Potential Measurements
   Mechanical Sounding (chain drag)  Radar  Radiography
   Rebound Hammer  Thermal/Infrared  Ultrasonics (Pulse Velocity)
   Ultrasonics (Impact Echo) Vibration Analysis Visual Inspection
   Other  _______________________________________________
**Timber:**
- Acoustic Emission
- Mechanical Sounding
- Radiography
- Stress Wave Analysis
- Moisture Meter
- Visual Inspection
- Other

**Other Materials:**

<table>
<thead>
<tr>
<th>Material/Technique</th>
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</thead>
<tbody>
<tr>
<td>1)</td>
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<tr>
<td>2)</td>
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<td>3)</td>
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</tbody>
</table>

4. Of these NDE techniques, which method is used most often for each material?
   - Steel: ____________________________________________________________
   - Concrete: ________________________________________________________
   - Timber: _________________________________________________________
   - Other Materials: _________________________________________________

5. Have you stopped using any NDE techniques due to unreliable performance or any other reason? If so, which techniques and why?
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________

6. What general area of NDE applications would you like to see more research into? *(mark one)*
   - Concrete decks
   - Concrete superstructure
   - Steel superstructure
   - Prestressed concrete superstructure
   - Timber decks/timber superstructure

Thank you for your time in completing this questionnaire. Your answers will allow the NDE Validation Center team to focus their efforts in the areas that will benefit the bridge inspection community the most.
Please answer all questions to the best of your ability. Note that some questions may require you to respond as if you were responsible for all bridge inspections done by your company. If you wish to comment further on any question(s) or qualify your answer, feel free to include additional sheets or use the margins. Upon completion of the study, participants will receive a draft of the compiled responses.

Any questions regarding this survey should be addressed to Mr. Dennis Rolander at the NDE Validation Center at (703) 285-1133. Return the completed questionnaire by **January 22, 1998** by faxing to (703) 285-1175 or using the enclosed envelope and mailing to:

NDE Validation Center – HNR-20  
State of the Practice Survey NDE/Visual Inspection  
6300 Georgetown Pike  
McLean, VA 22101-2296  
ATTN: Dennis Rolander

**Section 1 – Composition of Bridge Inspection Team for Visual Inspection**

1. What types of bridge inspection services does your company perform? *(mark all that apply)*
   - [ ] Routine Inspections
   - [ ] Fracture Critical Member Inspections
   - [ ] Advanced NDE techniques
   - [ ] Complex structures
   - [ ] Structures with complex traffic control situations
   - [ ] Underwater inspections
   - [ ] Other *(please describe below)*

   ____________________________________________________________

2. For the following hypothetical bridge, how many people would make-up a field inspection team (excluding traffic control personnel), and how much time would be budgeted?
   Twenty-year old, two-span bridge carrying two-lane road (medium ADT) over a small creek, maximum height above the creek is 20 ft.  
   **Superstructure**: Steel, fabricated four-girder superstructure (rolled shapes); welded flange cover plates; concrete deck.  
   **Substructure**: Concrete abutments, a single three-column concrete pier (with pier cap) out of the normal watercourse.

   People: ___________________  
   Man-hours: ________________
3. What are the minimum, maximum, and typical numbers of personnel that would make up a bridge inspection team (excluding traffic control personnel)?

   Minimum: __________________
   Maximum: __________________
   Typical: __________________

4. Estimate the percentage of bridge inspections completed with a registered Professional Engineer (PE) on-site? (circle one)

   0-20%  21-40%  41-60%  61-80%  81-100%

5. When a PE is included as part of the on-site inspection team, what conditions would dictate his/her presence?

   ________________________________________________________________
   ________________________________________________________________

6. Please indicate the average number of years of experience in bridge inspection at each of the following positions. (circle the appropriate response)

   **Team Leader:**
   - 0-5 years & PE
   - 5-10 years
   - More than 10 years

   **Other team members:** (indicate number of inspectors)
   - 0-5 years
   - 5-10 years
   - More than 10 years

---

**Section 2 – Impact of Administrative Requirements on Visual Inspection**

1. Approximately how many bridge inspectors are in your bridge inspection unit?

   1-5  6-10  11-15  16-20  21-25  26-30  31-40  41-50  More than 50

2. Approximately how many bridges are inspected by your organization each year? _______

3. What type of training do you require of bridge inspectors? (mark all that apply)

   **Team leaders:**
   - Associate’s Degree CE Technology
   - Bridge Inspector’s Training Course
   - Bachelor’s Degree CE
   - Fracture Critical Inspection Course
   - Stream Stability Course
   - Other Training Courses (please specify)

   ________________________________________________________________
   ________________________________________________________________

   **Other team members:**
   - Associate’s Degree CE Technology
   - Bridge Inspector’s Training Course
   - Bachelor’s Degree CE
   - Fracture Critical Inspection Course
   - Stream Stability Course
   - Other Training Courses (please specify)

   ________________________________________________________________
   ________________________________________________________________
4. Could you suggest any changes in administrative or inspection procedure or policy that may improve inspection performance? Explain.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

5. Do you test the vision of the inspectors (with corrective lenses if necessary)? (circle one) Yes No

6. For a given bridge, are copies of previous inspection reports made available to the inspectors prior to arriving at the bridge site? (circle one) Yes No

7. Are inspectors permitted to use copies of previous inspection reports at the bridge site? (circle one) Yes No

8. Who determines the order of field inspection tasks? (Mark the most appropriate response)
   _____ “Management” provides a checklist to the on-site team to organize the inspection process.
   _____ Individual inspectors on-site set the inspection process.

9. What measures do you have in place to assure quality inspections?

_______________________________________________________________________
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Section 3 – Current and Future Use of NDE Techniques

1. Do you have any American Society for Nondestructive Testing (ASNT) Level III Inspectors on staff? (circle one) Yes No

If so, what method(s) are they certified for? (check all those that apply)
   _____ Acoustic Emission (AE)
   _____ Electromagnetic Testing (ET)
   _____ Leak Testing (LT)
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   _____ Radiographic Testing (RT)
   _____ Thermal/Infrared Testing (TIR)
   _____ Ultrasonic Testing (UT)
   _____ Vibration Analysis Testing (VA)
   _____ Visual Testing (VT)

If applicable, are these ASNT Level III Inspectors routinely used in field situations? (circle one)
   Yes No
2. Mark any certifications which the typical Bridge Inspection Team Member may hold. *(Mark all that apply. Note that NICET refers to the National Institute for Certification in Engineering Technologies (NICET) Bridge Safety Inspection.)*

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3. What NDE techniques are currently utilized on bridges under your jurisdiction? *(mark all that apply)*

**Steel:**
- Acoustic Emission
- Eddy Current
- Other Electromagnetic Testing
- Liquid Penetrant
- Magnetic Particle
- Radiography
- Thermal/Infrared
- Ultrasonic
- Vibration Analysis
- Visual Inspection
- Other

**Concrete:**
- Acoustic Emission
- Cover Meters/Pachometers
- Electrical Potential Measurements
- Mechanical Sounding (chain drag)
- Radar
- Radiography
- Rebound Hammer
- Thermal/Infrared
- Ultrasonics (Pulse Velocity)
- Ultrasound
- Vibration Analysis
- Visual Inspection
- Other

**Timber:**
- Acoustic Emission
- Mechanical Sounding
- Moisture Meter
- Radiography
- Stress Wave Analysis
- Visual Inspection
- Other

**Other Materials:**
- Material
- Technique
  1)
  2)
  3)

4. Of these NDE techniques, which method is used most often for each material?

**Steel:**

**Concrete:**

**Timber:**

**Other Materials:**

5. Have you stopped using any NDE techniques due to unreliable performance or any other reason? If so, which techniques and why?

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
6. What general area of NDE applications would you like to see more research into? (mark one)
   ___ Concrete decks
   ___ Concrete superstructure
   ___ Steel superstructure
   ___ Prestressed concrete superstructure
   ___ Timber decks/timber superstructure

In conjunction with the development of the Federal Highway Administration’s new NDE Validation Center, we plan to ask bridge inspection teams to participate in various visual inspection benchmark tests. The information gathered during these “hands-on” benchmark tests will provide bridge inspectors with valuable information about the factors affecting the reliability of visual inspection. The goal of this survey and the follow-up visual inspection tests is to help the bridge inspection community to perform more reliable bridge inspections. **Would you be willing to participate in the “hands-on” study?**

Thank you for your time in completing this questionnaire. Your answers will allow the NDE Validation Center team to focus their efforts in the areas that will benefit the bridge inspection community the most.

Go back to main publications page to access the remaining sections of this appendix.